In the Claims:

1. (Currently Amended) A method for inspection of periodic structures on a lithography mask using a microscope with adjustable illumination and an operating element used for movement of a mechanical stage wherein the lithography mask is attached to the mechanical stage in order to record images of the lithography mask at a computer-controlled location on the lithography mask, wherein a position, a size and a pitch specification of the mask are stored, the method comprising:

calibrating a first image of each array structure for selected locations on the lithography mask;

calculating Fourier coefficients at a reference point of an array/diffraction grating;

calculating a residual image from a difference between an original image of the array structure and a Fourier expansion; ~~and~~

forming a threshold value for the calculation of an image indicating an error; and

repairing the lithography mask when an error exceeds the threshold value.

2. (Original) The method of claim 1, wherein the calibrating is carried out by determining a mask rotation and determining a magnification.

3. (Original) The method of claim 2, wherein the determining the mask rotation and the magnification are carried out by numerical optimization wherein a rotation angle and a magnification factor are chosen such that a magnitude of the associated Fourier coefficient is a maximum.

4. (Original) The method of claim 1, wherein a frequency filter is used to reduce curling in the residual image.

5. (Original) The method of claim 1, wherein the Fourier coefficients are determined and calculated in accordance with an error determination algorithm, the method comprising:

measuring the Fourier coefficients of a main position at a large number of points on the mask;

converting the Fourier coefficients to a line width value by means of back-transformation and a predetermined intensity threshold value;

determining a mean value of an error in a line width by forming an average value over all the measurement points; and

rejecting the lithography mask if the error in the line width is greater than the predetermined threshold value.

6. (Original) The method of claim 5, wherein the determining a mean value of an error comprises:

recording each mask position using different focal lengths;

measuring the width of the image lines and the image lines' separations by use of Fourier analysis; and

determining the error from the defocusing and from the difference between the adjacent intermediate spaces when the error exceeds the predetermined threshold value.

7. (Original) A method for producing a lithography mask, wherein the method comprises:

coating the lithography mask;

developing the lithography mask;

etching the lithography mask;

inspecting the lithography mask, wherein the inspecting comprises calibrating a first image of each array structure for selected locations on the lithography mask, calculating Fourier coefficients at a reference point of an array/diffraction grating, calculating a residual image from a difference between an original image of the array structure and a Fourier expansion, and forming a threshold value for the calculation of an image indicating an error; and

repairing the lithography mask based upon results of the inspecting.

8. (Original) The method of claim 7, wherein the lithography mask comprises a chromium mask.

9. (Original) The method of claim 7, wherein the lithography mask comprises a half-tone mask.

10. (Original) The method of claim 7, wherein the lithography mask comprises an interference mask.

11. (Original) The method of claim 7, wherein the repairing is carried out by means of ion etching.

12. (Original) The method of claim 7, wherein the repairing is carried out by use of an atom microscope for microprocessing of the lithography mask.

13. (Previously Presented) A method of manufacturing a semiconductor device, the method comprising:

manufacturing a lithography mask;

inspecting the lithography mask, wherein the inspecting comprises calibrating a first image of each array structure for selected locations on the lithography mask, calculating Fourier coefficients at a reference point of an array/diffraction grating, calculating a residual image from a difference between an original image of the array structure and a Fourier expansion, and forming a threshold value for the calculation of an image indicating an error;

forming a resist material over a semiconductor substrate;

patterning the resist material using the lithography mask; and

affecting the semiconductor substrate based on the patterning.

14. (Original) The method of claim 13 and further comprising repairing the lithography mask based upon results of the inspecting.

15. (Original) The method of claim 14, wherein the repairing is carried out by means of ion etching.

16. (Original) The method of claim 14, wherein the repairing is carried out by use of an atom microscope for microprocessing of the lithography mask.

17. (Original) The method of claim 13, wherein effecting the semiconductor substrate comprises forming a portion of an array of memory cells.

18. (Original) The method of claim 13, wherein the calibrating is carried out by determining a mask rotation and determining a magnification.

19. (Original) The method of claim 18, wherein the determining the mask rotation and the magnification are carried out by numerical optimization wherein a rotation angle and a magnification factor are chosen such that a magnitude of the associated Fourier coefficient is a maximum.

20. (Original) The method of claim 13, wherein the Fourier coefficients are determined and calculated in accordance with an error determination algorithm, the method comprising:

measuring the Fourier coefficients of a main position at a large number of points on the mask;

converting the Fourier coefficients to a line width value by means of back-transformation and a predetermined intensity threshold value;

determining a mean value of an error in a line width by forming an average value over all the measurement points; and

rejecting the lithography mask if the error in the line width is greater than a predetermined threshold value.

21. (Original) The method of claim 13, wherein the determining a mean value of an error comprises:

recording each mask position using different focal lengths;

measuring the width of the image lines and the image lines' separations by use of Fourier analysis; and

determining the error from the defocusing and from the difference between the adjacent intermediate spaces when the error exceeds the predetermined threshold value.